control individuals. The ACh contents were determined before and after incubation. The findings are given in Fig. 1, where it is seen that no significant differences in the amount of synthetized ACh were obtained regardless of whether or not thymus or serum from patients with myasthenia gravis were added to the medium. We also failed to observe significant differences between the amounts of ACh formed in Locke solution and in human serum. The latter findings are in contrast to Torda and Wolff's observations on frog brain.

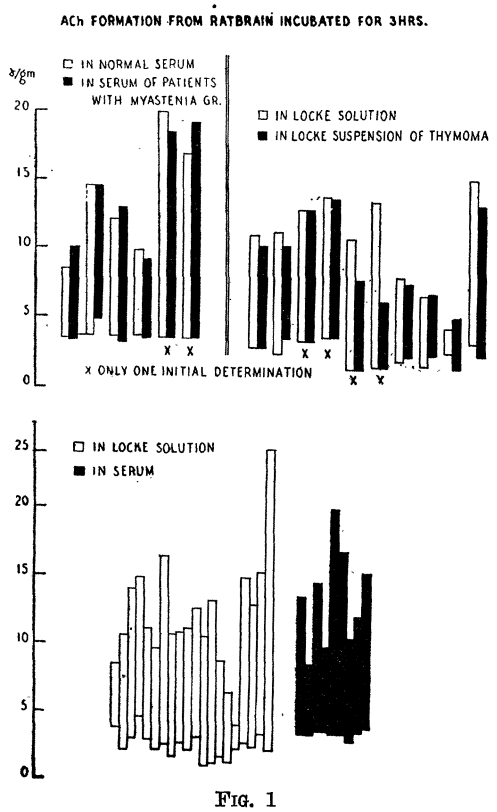

FIG. 1

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ANTITYPHOID ACTIVITY OF Vi ANTIGEN FROM EXTRA-GENERIC SOURCES[1]

LONGFELLOW and Luippold[2] reported a high degree of immunity to large doses (10,000 to 1,000,000 MLD) of *E. typhosa* in mice immunized with vaccines prepared from the V-forms of Salmonella which, aside from their content of Vi antigen, were antigenically alien to the typhoid bacillus. Against such large challenging doses, vaccines prepared with the V-forms of *S. ballerup* and *S. coli* 5396/38 produced an immunity in mice against Vi strains of the typhoid organism which was quite as high as that produced by vaccines prepared in an identical manner with Vi strains of *E. typhosa*. It may be added here that the typhoid cultures used in these experiments and in the more recent investigations reported below consisted of pure V-form organisms, having been lyophilized as such and thereby maintained in their most active immunologic and pathogenic state.

It has recently been found that when mice were immunized with serial dilutions of *E. typhosa* and *S. coli* 5396/38 vaccines and subsequently challenged with small "invasive" doses (50 to 1,000 MLD) of typical Vi strains of *E. typhosa*, the *S. coli* 5396/38 vaccine proved to be significantly *more* effective. In short, *S. coli* 5396/38 vaccine produced a higher degree of immunity to *E. typhosa* than did *E. typhosa* vaccine itself. This anomalous result was obtained repeatedly, even when the typhoid vaccine and the challenging organisms were represented by the identical strain of the typhoid bacillus.

It is believed that this superiority of *S. coli* 5396/38 vaccine is a simple quantitative manifestation—that is, a manifestation of a greater quantity of Vi antigen on the V-form *S. coli* 5396/38 organisms than is present on the V-form typhoid bacilli. Some support of this assumption was obtained from dilute-HCl extracts of these two organisms; for, when these extracts, as cleared supernates, were inoculated into mice, there resulted an even greater dominance of *S. coli* 5396/38 over *E. typhosa* in antityphoid immunogenic potency. Just as, organism for organism, *S. coli* 5396/38 vaccine was the more effective, so was the quantity of available Vi antigen on this organism the greater.

In this way, it was found that the immunogen responsible for this immunity was easily removed from the organisms by solution in diluted HCl, from which it could be precipitated with acetone and recovered as a light-brown crystalline powder. Minute amounts of the latter (Vi extract) exhibited marked antityphoid immunogenicity as gauged by the potency of Wakeman's polysaccharide[3] and of Morgan's purified antigen[4].

In comparative mouse-immunization tests with alcohol-insoluble fractions of autolysates (Morgan) or tryptic digests (Wakeman) of the typhoid bacillus, this Vi extract from *S. coli* 5396/38 proved to be more potent per unit of dried material than the typhoid antigens cited above, when opposed by the lower invasive doses (100 to 1,000 MLD) of virulent typhoid organisms. When enormous challenging doses (10,000 to 1,000,000 MLD) of the test organism were given, the antigens prepared from autolysed or digested typhoid bacilli appeared to be somewhat more effective

[1] Preliminary report.

[2] D. Longfellow and G. F. Luippold, *Am. Jour. Hyg.*, 37: 206–210, 1943.

[3] F. B. Wakeman, *Military Surgeon*, 84: 318–338, 452–471, 1939.

[4] H. R. Morgan, *Jour. Immunol.*, 46: 161–180, 1941.

than the Vi extract. The probable interpretation of these results is that the Vi extract possessed the capacity to produce superior anti-invasive immunity, while the typhoid antigens excelled in producing substances which neutralized the toxicity of large doses of bacterial protein—presumably because these typhoid antigens represented more completely the entire typhoid organism.

Although the Vi extract can be prepared from V-form typhoid organisms, the V-form of *S. coli* 5396/38 offers an appreciably more abundant source of this substance which, despite its extra-generic origin, possesses exceptional antityphoid immunogenic properties. Practical application of the use of this Vi extract—specifically as a fortifying agent in bacterial vaccines and in combination with conventionally prepared immunogens of the typhoid bacillus—are under consideration. Studies of its toxicity and stability and of its serological characteristics are now in progress and will be made the subjects of later detailed reports.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN APPARATUS FOR MEASURING THE TORSION ANGLE IN LONG BONES

RECENTLY, in a problem involving measurements of the degree of torsion existing in certain long bones of the extremities, it became necessary to construct a device for making such measurements. Although this torsiometer was devised for use in a particular project, it might also find application in making other anthropometric measurements or in various studies requiring rather exact values for the degree of torsion or twisting of an object. The following is a description of the construction and use of the apparatus.

As shown in Fig. 1, the apparatus consists essentially of a 360° plastic protractor (A) and a pair of pointers (B), attached to a shaft (C) passing through the protractor's center. The protractor and shaft are mounted on a pivot (D) so that the shaft may be swung from side to side if necessary. To permit this swinging the support (E) must be triangular in cross-section, with the apex directed forward. The whole is mounted on a solid level base.

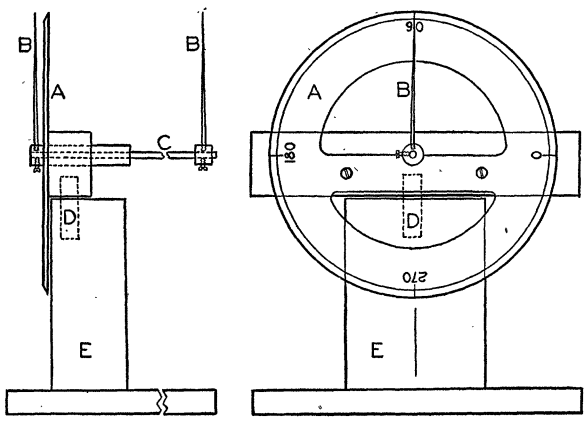

FIG. 1. Diagram of the torsiometer showing side and front views.

Shafts of various lengths may be used, depending upon the length of the object studied, or as in Fig. 1, the indicators may be threaded and screwed into tapped washers; the washers and indicators may then be moved along the shaft and fixed at the desired position with a set screw. The shaft should be perfectly straight and should fit snugly in its bushing.

The size of all parts, of course, will be arbitrarily determined by the size of the object to be studied.

An ordinary ring stand and clamp will usually suffice to hold the object.

Before making a measurement, it is important to have both indicators in exact alignment. The bone (or other object) is clamped rigidly, parallel to the shaft with the long axis of the proximal epiphysis in line with the 90° radius of the protractor. The indicator at the free end of the rod is then turned until it is in line with the long axis of the distal extremity of the bone, and the protractor indicator moves with it. The number of degrees through which the shaft has turned is then read off directly on the protractor.

In cases where the object is not perfectly straight, but is curved to one side or the other, the protractor and shaft may be turned on the pivot until the rear indicator is in alignment with the distal end of the object.

This device has several points to recommend it. The parts are inexpensive and easily obtained. It is easily constructed and readings may be made directly, simply and rapidly.

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